

Inventory and Monitor Project #657192

(July 16, 2003 – January 21, 2004)

(final report)

Background

This is a report on the activities and progress within the scope of the project assignment as executed by Rob Culbertson, the sole designated employee. The job title described for this assignment is “Biological Technician”. The work assignment required the employee to independently carry out special programs related to three different invasive species (*Miconia calvenscens* - ‘Miconia’, *Eleutherodactylus coqui* - ‘Coqui frog’, and *Sphaeropteris cooperi* - ‘Australian tree fern’) perceived as threats to Hawaii Volcanoes National Park. The work primarily consisted of distribution mapping in and around the Park as an aid in the overall Park program of incipient population eradication. The following sections provide detailed accounts by individual species.

Miconia calvenscens – Introduction

This assignment called for the continuation of prior surveys and public outreach in many designated subdivisions down slope from the park in the path of spreading infestations of the plant known as the “Purple Plague” and listed as the State of Hawaii’s number one noxious weed. All told, approximately 8,000 acres of land accessible by road were surveyed. The surveys utilized the metadata protocol established by the GIS Node Support Center at Hawaii Volcanoes National Park (HAVO). Data was submitted through the Big Island Invasive Species Committee (BIISC) geographic information systems and will ultimately be made available to decision makers and the public.

Historically, the Park has played a key role in supplementing survey and control work in Upper Puna, the Park’s extended buffer zone. Starting in 1996, the Park, as a member of the Big Island Melastome Action Committee (BIMAC), began surveying to a more thorough degree than was feasible through the earlier Miconia program under the auspices of BIMAC. They also provided educational outreach and control functions in the same area.

Methods and Limitations

Roadside surveys were conducted in the greater Volcano area subdivisions listed in the table below. Every listed subdivision was surveyed at least twice during the term of the project.

Table 1. Survey Sections & Areas

Survey Section	Survey Areas	Miles of Road	Acres of Land	Avg. Lot Size (Acres)
1	Volcano Golf Course Subdv.	5.73	269	0.25
2	Wright Road Farms	3.26	1529	30
3	Volcano Village / Cymbidium Acres	15.87	1340	1
4	Mauna Loa Estates	13.51	548	0.5
5	Ohia Estates	3.36	235	0.25
6	Royal Hawaiian Estates	9.46	694	0.5
7	Hawaiian Orchid Isle Estates	8.4	680	3
8	Fern Forest *	1.62	541	3
9	Eden Roc *	27.6	2009	1
	Totals:	95.65	8238	-

In the areas of known historic infestations (marked with *) a more intensified engagement with residents was made either by direct solicitation or by leafleting strategically located properties.

Additionally, various public outreach venues provided further opportunities to engage public attention and produce “leads” as to possible plant sightings. I regularly set up an information table at the Volcano farmer’s market on Sunday mornings. And I met with leaders and attended meetings of several neighborhood watch groups.

Working alone, I was limited to visibly survey only what was possible from public access roads or easements. I typically did not ingress larger properties with long driveways to get a better view. I did try to speak with anyone I might pass close to in areas of particular interest or with known historical infestations. Often times I would reconnoiter with binoculars from a top my parked vehicle in areas with a commanding view. I also walked some public roads that were otherwise too narrow,

overgrown or soggy to risk driving through. Occasionally, aggressive dogs prevented a lingering view into some areas of interest.

Results

As a result of the surveys and public outreach activities, including field solicitations in sparsely populated rural subdivisions, *one* immature plant and *three* large mature plants were identified and ultimately removed by BIISC staff. The attached map (labeled figure 1 in this section) shows the locations of four Miconia plants that were discovered via the methods described. The current status as well as the size (maturity) of the plant is also indicated in the legend.

Discussion

Public involvement is crucial in this type of program. The efficiency of the work increases automatically when leads can be developed from cooperative landowners. Even with helicopter reconnaissance flights available, the rough terrain and dense tree cover make it difficult to discover isolated populations by air. Moreover, aerial surveillance often provokes a negative or hostile reaction by residents on the ground sometimes making outreach efforts more difficult.

It seems that most of the people I talked to were fairly well acquainted with the plant. However, one notable exception was the owner of the now abandoned Eden Roc Flowers anthurium farm who wasn't aware that a plant she was calling the 'beefsteak plant' was indeed a Miconia tree. Evidently, she had been cutting it back for some years prior to its identification during a recent survey. (It has now been destroyed by BIISC staff.)

I received several leads from individuals encountered in the surveyed areas about sightings in areas outside of these areas. In order to counter an unfavorable impression that their information was not immediately relevant, I made the effort to either personally investigate the claimed sightings or discuss them with BIISC staff. I believe one of the potential pitfalls within the current Miconia strategy may be the inadvertent undermining of public confidence in the program due to an impression that reports are not always acted upon in an expeditious or visible manner. My impression of this attitude is more intuitive than explicit. No one directly dismissed the effectiveness of the Miconia program but quite a few individuals would truculently state that they knew of such and such a place that was 'choke' with Miconia as if it were common knowledge yet which no authority had apparently

taken seriously. Whether a fair impression or not, this may be the down side of a mature (and under-resourced) campaign.

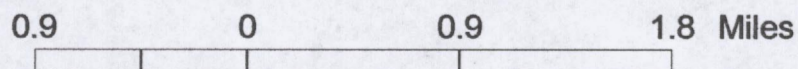
I leave this assignment with a nagging suspicion about several unconfirmed reports of plants in the public lands makai of lower Jungle King Road in the Fern Forest subdivision, an area known for its historic infestations. The Operation Miconia team likewise remains concerned about the possibilities of any new or escaped infestations in the natural areas bordering Eden Roc and Fern Forest subdivisions. Permissive access and dangerous physical terrain are current limitations to the further reconnaissance necessary in this area.

Suggestions

As already mentioned, beyond making the rare obvious sightings from the roadside, the cultivation of personal contacts is the key to the kind of long-term sustainable campaign that is needed. Continuity requires public confidence. And public confidence sometimes requires personal initiative and versatility. Particularly in some of the economically depressed rural areas visited, the challenge of enlisting cooperation is pivotal and must begin even before an operation gets started.

In order to enlist a greater degree of public cooperation in affected communities it would be advantageous to have a person such as a community 'liaison' either from the agency soliciting information or from within the community itself. Perhaps such a person could be trained within the agency or trained as a volunteer in the community. This person's key responsibility would be to network within the community, among diverse interest groups such as hunters, construction workers, and gardeners etc., to elicit a flow of information about infestations. This person should possess sufficient communication skills and a positive 'can do' attitude that would encourage people to work with him (her). He (or she) should exhibit evidence of following through with any information offered. It would also be important for this person to have the most complete history of the target species in the community. (My predecessor's reports were valuable in directing me to key contacts in a given area. Also, my state of knowledge was often challenged and some history was useful in explaining my presence! And insights gained from prior work were important in adjusting my outreach approach.) Thus, a complete working knowledge and a wealth of personal contacts within a given community are important keys to providing a foundation and the future continuity of critical intelligence necessary for a positive outcome.

Miconia - Fern Forest / Eden Roc



 **Immature**

The ultimate step would be to have trained volunteers in each community available to act proactively on their own initiative. The work now being done in Leilani subdivision in cooperation with BIISC appears to be the kind of citizen based voluntary program that should be replicated in upper Puna subdivisions.

Eleutherodactylus coqui - Introduction

The Caribbean tree frog species *Eleutherodactylus coqui* or “Coqui” is a recently introduced species, first notice on the island of Hawaii around 1988. Coqui arrived incidentally along with nursery materials from the continental United States. Today Coqui are frequently moving from nurseries, to retail outlets, and then finally to residences around the island. New populations are starting up in every district at an alarming rate. It is not known if the frog is nearing the margins of its ecological range as it turns up in higher altitudes.

The continued expansion of Coqui frog populations in the greater Volcano area next to Hawaii Volcanoes National Park (HAVO) is a major impending threat. The problems of control will be greatly exacerbated if breeding populations eventually become established in wild lands. This concern has prompted HAVO officials to initiate the seasonal application of monitoring and control efforts in a designated ‘buffer zone’ east of the Park. Like the Miconia project, my work surveying and monitoring Coqui frogs in this buffer zone served the interests of the Park specifically and the Big Island Invasive Species Committee generally.

Coqui are most comfortable in the warmer climates of lower altitudes, but can survive cooler high-altitude winters. Conducting surveys in the warmer months yields better results, as male Coqui call less vigorously and less frequently in cold weather. For this reason a disproportionate amount of my time during the summer and autumn months was devoted to finding and recording the locations of the frogs.

The strategy of rapid response and containment appears to be working to prevent the frog’s establishment in the wild lands and associated state forest reserves around the Park.

Methods and Limitations

Continuous loop surveying in nearly all road access areas within the designated project boundaries yielded important and timely information on the movement and trends of the infestations. Table 1 of this section shows the subdivisions included in the survey

Table 1. Survey Sections & Areas

Survey Section	Survey Areas	Miles of Road	Acres of Land	Avg. Lot Size (Acres)
1	Volcano Golf Course Subdivision.	5.73	269	0.25
2	Wright Road Farms	3.26	1529	30
3	Volcano Village / Cymbidium Acres	15.87	1340	1
4	Mauna Loa Estates	13.51	548	0.5
5	Ohia Estates	3.36	235	0.25
6	Royal Hawaiian Estates	9.46	694	0.5
7	Hawaiian Orchid Isle Estates	8.4	680	3
8	Fern Forest	1.62	541	3
9	Kilauea Military Camp	1.67	55	-
10	HQ / Housing / Environmental Ed. Ctr.	2.59	135	-
11	Research / Greenhouses / Escape Rd	2.58	203	-
	Totals:	68.05	6229	-

Again, GPS data was utilized in tracking the various sightings, which is in turn available for mapping and further study pursuant to larger comprehensive strategies for control on the island. Additional field notes recorded times and temperatures associated with observed activity. These notes should be helpful in understanding the frog's adaptive reactions upon introduction into various locations considered less than ideal for their long-term propagation.

Public outreach activities such as consistently tabling at the farmer's market in Volcano were extremely effective in producing numerous important and timely leads on frog appearances. The existing BIISC hotline and the Volcano area nighttime hotline too, was quite instrumental in helping to respond quickly to new frog sightings. In general, the public's perception of the gravity of this threat has greatly aided the project's success so far.

The outreach and education mission was well served by several forms of printed brochures and posters previously produced and continuing to be used in public venues and field contacts. The pamphlet, 'Coqui Frog- Control for Homeowners' published by the University of Hawaii, was picked up most frequently at outreach venues.

Results

At least three complete survey passes were conducted throughout the designated project area. Based on this work, the appearance of numerous isolated individual male frogs and several new breeding populations were recorded for future control. The attached map (labeled Figure 1 in this section) shows the distribution and present status of the frogs within the project area.

In total to date, *51* male frogs were identified for hand control and an estimated *12* to *15* more likely succumbed in a special spray operation by the BIISC crew on the leading (closest to the Park) edge of the breeding infestations.

Discussion

Although it is a fact that there exists some public disapproval of the campaign to eradicate Coqui frogs, overall my experience in the Volcano community and throughout the designated work zone reflected a widespread appreciation for the survey and education work I undertook. This support was gratifying and enabled me to make the most of the many leads provided to map the distributions shown.

Most of the leads I received were confirmed as true sightings rather than misidentifications of noises. The uniquely notable call of the male frog is an identification key that works as an aid in motivating individuals to report such occurrences.

Anecdotal accounts abound of Coquis being brought to the Volcano area inadvertently in potted plants, in green-waste, in junk cars, and in construction equipment such as bulldozers, from lower altitudes and areas with large infestations such as Hilo and lower Puna. Some stories persist of acts of pure perversion to bring them up and turn them loose in the Volcano community. I wasn't able to confirm these stories in any meaningful way.

At the end of this project term there remain at least *ten* sites (see map attached as figure 1) in the project zone where frogs were '*Confirmed*', meaning that there was at least one frog at one time, which may or may not still be at large. The matter is technically unresolved. The following list gives some details of each site.

- At the end of Wright Rd. on the Finley property there was one frog known to be in amongst several Hapu`u tree ferns near their driveway. The Finleys made exhaustive efforts to clear brush and isolate the frog but could never get close enough to spot it. They eventually laid hydrated lime around the suspected sites. For several months since then they reported not hearing any noises from that area.
- At the northeast corner of Haunani Rd. and Old Volcano Rd. up in a Sugi pine tree there was known to be a lone frog for several years. As of about mid October this frog too quit making noise and its existence remains a mystery.
- One persistent vocalizer at Ka`Ohelo Place in the Golf Course subdivision was still making calls into November per the owner of the property, Ms. Eva Classen. This one too was always out of reach in a Sugi pine tree in her front yard. It will be interesting to see if it can over-winter at its 4,000+ ft. elevation.
- There were at least two frogs, one on each side of 8th St. (near the corner of Jade in Mauna Loa Estates) on two residential properties known until about October after which repeated attempts to re-confirm them proved fruitless. One of the renters said he was actively pursuing the one near his house (northerly unit of two units on mauka side of 8th) when last contacted about the situation.
- A frog sighting near the bottom of Pa Alii St. in the Royal Hawaiian Estates subdivision, mauka side, was confirmed in early July but an uncooperative resident prevented me from gaining access to the empty lot to further pinpoint its location. The situation remains unresolved.
- There may still be one new frog (another was caught earlier) at the Volcano transfer station. It was last heard by reliable witnesses in mid October.

- There is still one of three confirmed frogs unaccounted for at the Dixon property near the corner of Iiwi and Kilauea Roads in Volcano Village. Two were captured and the owner reports not hearing anymore noise since then.
- The so-called '**Bowden**' infestation near the corner of Kanilehua and Anuhea St. in Royal Hawaiian Estates consumed a lot of my time during the summer and fall. I repeatedly went back to identify locations of frogs that continually seemed to change. BIISC staff would apply controls as necessary. As of early November my follow up visits didn't detect any more chirping but I estimate at least 4 male frogs may probably still be alive and likely to over-winter.
- At the '**Carson**' site on Kahauale'a Rd. no work was done. My predecessor, Kim Tavares, had been refused access by the owners of this large agricultural parcel in the past and my own appeals for cooperation were likewise met with resistance. The best strategy going forward is to monitor the surrounding parcels diligently and try to exert control there to prevent the spread from the infested site.
- The '**Old Quarry**' site was a large agricultural parcel adjacent to Old Volcano Highway about a quarter of a mile up from Alii Anela Rd. in Royal Hawaiian Estates. A breeding population estimated at about 12-15 males was the subject of a special spray operation with personnel from the Big Island Invasive Species Committee, the State Department of Agriculture, and Hawaii Volcanoes National Park. Because of the open terrain a truck mounted spray rig could be deployed using citric acid as the specific pesticide. After initial spraying in the designated target zone, several follow-up visits and hand captures were effective in ultimately silencing the treated area.

'Unconfirmed' sites shown on the map refer to sites where reports were made but I was not personally able to substantiate them. I place a high degree of confidence in one recent report from Mr. Kruppa about one or possibly two frogs that have chirped as recently as late December in or near his yard on 5th St., just up from Pearl, in the Mauna Loa subdivision. Two other sites shown on the map, near the highway edge close to Pearl St., I deem to be of dubious value. (I had repeatedly visited those locations following up when the reports were made but was unable to detect any noise

even when conditions were most favorable.) One more site that remains unconfirmed is near 5th and Ruby in Mauna Loa Estates.

The term '**Removed**' indicates the various locations where one or more frogs were captured or killed by BIISC crew or private land owners. With the exception of the '**Bowden**', '**Carson**' and '**Old Quarry**' infestations, the sites are thought to have been outposts of discreet single males.

It is hoped that the special efforts to interdict the breeding populations at the '**Old Quarry**' site and the '**Bowden**' site will have proved important turning points in the season's battle for control of the pest in the HAVO buffer zone.

The table that follow provides a graphic summary on the current status and the trends of the infestations over several years beginning in 1998.

Table 3. Coqui Around Hawaii Volcanoes National Park – Trends

Year	Reported Locations	New Sites Confirmed	New Populations Detected
1998	0	-	-
1999	1	1	-
2000	5	-	-
2001	31	12	3
2002	52	4	1
2003	60	23	3
Totals	149	40	7

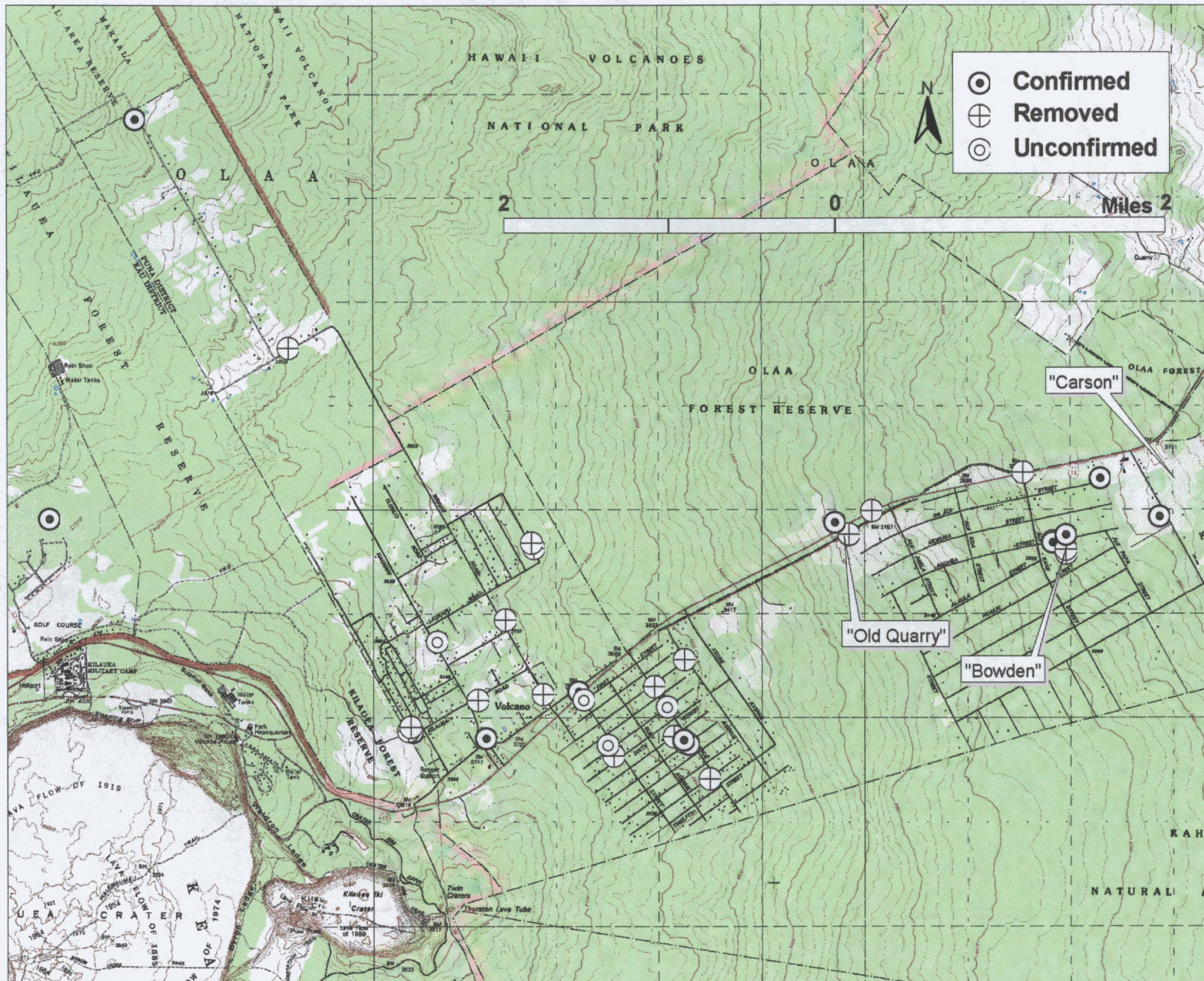
Suggestions

As dire as the spread of Coquis may seem, I believe their high profile status is yielding the kind of positive support and public awareness that few other invasive species confer. I note the potent interest of many in the real estate industry who now see this pest as a threat to their business. They appreciate the detrimental economic impact it is having on residential real estate as well as visitor industry accommodations. Few tourists will claim to being charmed by the incessant calls of the 'Caribbean tree frog' in Hawaii. Many

Figure 1. Coqui Detections / Status as of 2004 January 21

Caribbean Tree Frogs

Eleutherodactylus coqui



may flee from idyllic resorts when the word gets around that you can't get a good night's sleep in 'paradise' anymore.

For the Volcano buffer area it may be sufficient to maintain the high visibility, quick response type of monitoring that was conducted in 2003. With the level of public support greatly in favor of control as against control, an emphasis should be placed on a concerted outreach toward community volunteers willing to learn and implement the various existing techniques for control. A person in a 'community liaison' role could function well as a conduit for technical information and advice, an action demonstrator, and a broker for accessing equipment and supplies.

Sphaeropteris cooperi – Introduction

Based on the unfortunate experiences at Haleakala National Park on Maui where Australian Tree Ferns have shown themselves to be aggressive competitors to native Hawaiian tree ferns, the management team at Hawaii Volcanoes National Park is losing no time in sounding a public alarm after recently finding the alien tree ferns growing in surprisingly remote areas of the park.

Although not enough evidence can pinpoint the source of this incipient infestation, the most plausible explanation starts with the known landscape use of Australian tree ferns at private residences upwind from the park. These are found primarily in the Volcano Golf Course and Country Club subdivision, Volcano Village and Mauna Loa Estates subdivision.

This is a new project in 2003. Besides featuring the rudimentary roadside surveys, this campaign is heavily weighted toward public education and outreach. In interdicting the spread of this fast growing invasive tree fern, the good will of the public must be engendered and solicited first, as currently there is no legal prohibition on planting and propagating this landscape ornamental. Fortunately, the greater Volcano community has proven to be most sympathetic and supportive of this cause.

Public and private landowners with Australian tree ferns are being informed as to how the wind driven spores of their plants can and are taking root deep inside the park's boundaries. And now as a result of our campaign many residents are destroying these exotic and attractive plants in order to preserve

biotic integrity and the native Hapu`u - a distinctive symbol identified with the Kilauea volcano.

Methods and Limitations

Roadside surveys were conducted with a Park service vehicle further identified with placards indicating the public alert for invasive species. All the subdivisions shown in Table 1 below were surveyed at least twice. During the survey observations were made and persons available for discussion were engaged. This practice proved valuable in producing leads about many tree ferns not visible from the public roadways.

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Survey Section	Survey Areas	Miles of Road	Acres of Land	Avg. Lot Size (Acres)
1	Volcano Golf Course Subdv.	5.73	269	0.25
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4	Mauna Loa Estates	13.51	548	0.5
5	Ohia Estates	3.36	235	0.25
6	Royal Hawaiian Estates	9.46	694	0.5
7	Hawaiian Orchid Isle Estates	8.4	680	3
8	Fern Forest	1.62	541	3
	Totals:	61.21	5836	-

A range of products was created to give the public the information it needs to identify and understand the nature of the threat from the Australian tree fern. (See documents appended at the end of this section). Several articles were written and published in local newspapers. Flyers and posters were created and circulated at public events and posted in strategic locations including schools and markets. Some incidental television exposure was created through the on-going tabling events at the Volcano farmer's market. Additionally, I made presentations to civic groups at meetings in the Volcano area. This also provided me with important feedback, a means to gauge the relative effect of the campaign, and ideas on how to modify the message where necessary.

An important incentive featured in this campaign was an offer by Park officials to swap Hapu`u tree ferns for the alien Australian tree ferns. In lieu of any other offers of compensation, this feature I believe, made it easier to approach owners of their often-cherished tree ferns and obtain their cooperation in ultimately destroying them.

The campaign also derived great benefit from prior work done by the Biological Resources Division. From their shared data on prior roadside weed surveys a pattern of sightings particularly around the Volcano Golf Course subdivision became apparent. The common denominator among several custom homes in this upscale subdivision was that they were apparently designed and landscaped by the same professional who called out the alien tree fern as an ornamental specimen in each and every case. Often, owners knew who else owned homes built by the same architect and could direct me to them.

Another clue in locating Australian tree ferns was the observed use of them as horticultural novelties in landscapes that seemed to be aspiring to botanical gardens. Thus some bed and breakfast enterprises and other businesses with unusual landscape elements suggested cause for further investigation.

In order to understand the demand driving the choice of Australian tree ferns I also undertook a telephone survey of nurserymen and professional landscapers. Before doing so I first sought the advice of pertinent professional association officers. They in turn guided me to constituents most likely to be involved with my subject. Of seventeen nursery businesses that I attempted to contact, only two were non-responsive (failing to return my call). The variety of responses did yield some interesting if at times conflicting conclusions.

Three basic questions were asked:

- *Are you currently selling Australian tree ferns? (If not, why not.) Or, are you specifying it on plans? (In the case of designers and architects)*
- *Is there a pattern to demand? (More contractors or homeowners or about the same ratio of interest?)*
- *What alternatives could you suggest to fit in a design specifying a tree fern? (Where Aussies were intentionally being avoided.)*

Most of the operators interviewed were somewhat aware of the Park's campaign to discourage the use of Aussies in the Volcano area. One grower admitted selling them but stated that lately demand seemed to have fallen off and thought it might be due to a "***a recent article in the paper***" about them being a highly invasive species.

Several growers said they had discontinued handling Aussies because of concerns about them being invasive. Still, a slight preponderance said that although they had some concerns they would continue to sell them because of market demand. They said that Aussies were the most reliable, adaptable, and fastest growers compared to our native tree ferns or any thing else comparable they could think of. Because of tissue culture, growers can expect uniform quality in the quantities they need, at reasonable prices. Several of the growers also said that indeed, they could not keep up with demand. However, this last statement was qualified as relevant more to the dry side of the island than the East or windward side.

The pattern for this demand is probably a little higher for the combined uses of commercial and high end residential landscaping rather than homeowners of typical middle class track homes. This scenario is primarily driven by the specifications set forth in landscape designs by architects and landscape architects.

Few of the growers or designers could volunteer any suitable alternatives for the Australian tree fern besides the native Hapu`u (*Cibotium spp*). In suggesting several varieties of *Dicksonias*, most were unfamiliar with them.

An interesting observation has to do with the likelihood of spore germination under varying conditions. Several growers asserted that they had never seen Aussies naturalize in the lowlands (interpolated as about the 500 ft. elevation and below). Several said they didn't believe the plants could even make spores at that level. However, another grower attested that at his nursery at 1800 ft. in Holualoa, he had "***volunteers sprouting up like weeds all over the place***".

Results

As of January 18, 2004, ***nine individuals had committed to destroying a total of thirty-six Australian tree ferns*** as a result of our outreach and mapping effort. The following map (labeled figure 1 of this section) shows the distribution and status of the alien tree ferns discovered to date.

Figure 1. Australian Tree Fern Detections / Status as of 2004 January 21

Australian Tree Fern

Sphaeropteris cooperi



0.9 0 0.9 1.8 Miles

- ⊛ Detected
- ⊙ Removed

Discussion

The high level of cooperation with this project is likely due to sociological factors peculiar to this community. Rather than resent a possible perceived intrusion on their property rights, most members of the community were sympathetically responsive. This may have been due to the extensive feelings of attachment to the nearby Park and possibly based on personal loyalties to Park personnel as neighbors in many respects.

It may be worth noting that most of the cooperators were professionals of one sort or another and none complained about the apparent financial burden this may have put upon them. More often, the aesthetic consideration of finding a suitable alternative was their primary concern.

In the course of conducting my surveys I found another exotic tree fern, the 'Brown tree fern' (*Dicksonia squarrosa*) (sometimes incorrectly called the 'Tasmanian tree fern') in many landscapes, particularly in Volcano village. This tree fern is not known to be very aggressive and is in fact on my short list of potential alternatives. It was the subject of some confusion when reported sightings of Aussies led me to this tree fern instead. For the sake of future clarification I kept track of the locations of most of these but it is not a matter of record in this report or any exhibits attached.

Only late in the project term did I actually confirm evidence at a residential site of three small Australian tree ferns coming up on their own. The owner of this residence in the Golf Course subdivision, Dr. Nichols said that he had not planted them in the small bed of lilies along side his garage. He did acknowledge one large mature Aussie further back in his yard (evidently planted before his acquisition), which we both suspect was the mother plant for the naturalizing offspring. Both the mature and immature plants have since been destroyed by the owner. (Attached at the end of this section is a photograph of the 'keiki' tree ferns).

In looking at the responses of the phone survey of landscape professionals from around the island, it is intriguing to note the conditions under which naturalization may occur. It would certainly be of value to conduct more research beyond the anecdotal stage as to how and where Australian tree ferns may become a major threat. Perhaps their use along the hotter and drier Kona coast (below 500 feet) poses little or no threat to Hawaii Volcanoes National Park. Then again, if planted there, the threat may increase over time

as a series of progressive invasions; from the coast up to the closest lush environment such as Kaloko mauka, then up and over to the natural areas around Haulalai and Mauna Loa.

Currently, the Weed Risk Assessment program being developed through the University of Hawaii has the potential to be an important, albeit voluntary, influence on the professional landscape community. In correspondence with Curt Daehler, the botanist in charge of the program, it was noted that the Australian tree fern has yet to be analyzed by the system. Still, it is on the list of plants that need to be done and his intuitive sense from all that is known about it is that it is indeed likely to score high because of its invasive attributes. If so, it will be the first fern of any species to be so indicted in Hawaii!

The tree fern project undertaken in the HAVO buffer area, experimental in its outreach as it was, nonetheless gives us hope that a voluntary appeal crafted with enough incentives can make a difference in the absence of more stringent sanctions which should deservedly be applied in the future.

Suggestions

The various informational posters and fact sheets already created can be re-used at special events such as 'Earth Day' and other environmental events to promote awareness of the hazards of planting attractive yet aggressive species. As a by-product, reinforcing such general awareness may aid in building a specific consensus to discontinue the use of Australian tree ferns on the Big Island.

A more thorough going effort should be made to identify and promote suitable alternatives to Australian tree ferns. These could be publicized periodically in specific reference to the problems with 'Aussies'.

Currently, my list of alternatives includes:

- Native Hapu`u tree ferns (*Cibotium spp.*) - (where legitimately and certifiably procured and where they can successfully be grown).
- Other more adaptable native tree ferns such as Ama`u (*Sadleria spp.*) - (also where legitimately and certifiably procured).
- Several species of exotic tree ferns such as the 'Brown tree fern' (*Dicksonia squarrosa*) and 'Tasmanian tree fern' (*Dicksonia antarctica*)

- Other species of small palms such as the ‘Pygmy Date palm’ (*Phoenix roebelinii*).

As mentioned in the discussion, further research into the naturalizing tendencies and limitations of the ‘Aussie’ should be undertaken. This could take the form of satellite monitoring sites in different parts of the island such as Kaloko mauka, lower Hakalau (Chin Chuck Rd.), some higher elevations (>500 feet) around the Hilo fringe etc. Better factual information needs to be established about the behavior of the ‘Aussie’s’ spores and their propagation preferences. At present we can only speculate about the range of their reach.

Park officials and staff of the Big Island Invasive Species Committee should lose no opportunities to assert the threat from Australian tree ferns in public and professional forums. Calls for its listing as a noxious weed began over 10 years ago by responsible parties such as botanists working at Haleakala National Park. Currently, the University of Hawaii’s College of Tropical Agriculture & Human Resources as well as State Department of Land and Natural Resource’s Forestry Division have publications listing the Australian tree fern as a noxious weed. But still, the State Department of Agriculture has *not yet* listed it. And therefore no legal sanctions exist.

Unless specific legal sanctions are placed on this invasive plant it seems unlikely that voluntary restraint will be sufficient to curtail its spread over time throughout the lush places of the Big Island. As without legal sanctions there will continue to be those for whom no voluntary measures will be sufficient to persuade. For as one reputable landscape architect candidly confided to me regarding another highly invasive pest, *“If it wasn’t for the law I would love to use that Miconia plant. I still think it is so attractive!”*



Photo of small Australian tree ferns naturalized in a residential yard near Hawaii Volcanoes National Park

Appendices – Attached are samples of several forms of publicity generated for the various projects.

Featured above is an Australian tree fern (*Sphaeropteris cooperi*), an imported tree used in landscaping that has caused alarm by invading native forests at Hawaii Volcanoes National Park.

Invasion of the alien tree ferns

□ Tree ferns from Australia threaten to oust native hapuu

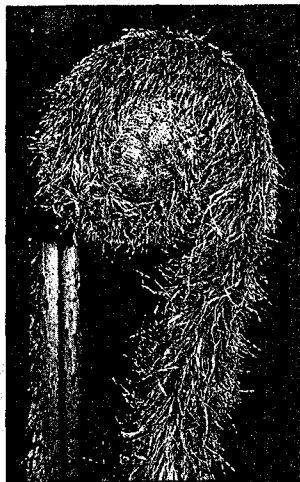
By Alan D. McNarie
For the Tribune-Herald

Two years ago, while working to control an infestation of myrica faya trees in Hawaii Volcanoes National Park, Chief Resource Manager Tim Tunison discovered a new cause for alarm: a young alien tree fern of a type he'd never seen in the park before, growing in the deep shade of the faya, where most plants normally can't survive.

"If they can handle that kind of shade, you worry about them getting started under hapuu [native tree ferns]," remarks Tunison.

Tunison called in a fern expert to confirm the identity of the plant.

"She was horrified," he recalls. What Tunison had discovered was an Australian tree fern, also known as a scaly tree fern (*Sphaeropteris cooperi*), an imported tree used in landscaping. Australian tree ferns had already caused alarm by invading native forests in Haleakala National Park



An emerging frond or "fiddlehead" of an Australian tree fern shows distinct white hairs and scales, in contrast to the native hapuu that has rust-colored hairs and no scales.

in Maui. Since the discovery of the first fern, the park's staff has found several more in widespread locations, from the Byron's Ledge in Kilauea Crater to the park's Olaa Forest tract, along Wright Road inland from Volcano Village.

The park, already plagued with

other invasive species, is striking back early on this one, with a public awareness program and a unique offer. According to Tunison, the park recently acquired a small number of century-old hapuu salvaged from a lot being cleared by a local homeowner. While supplies last, Tunison is offering to trade hapuu trees to residents in the Volcano area who have *Sphaeropteris cooperi* (formerly *Cyathea cooperi*) trees and are willing to get rid of them.

The Aussie ferns aren't illegal, but they meet many of the criteria for defining a noxious or invasive plant: They are fast growing, able to spread rapidly and widely, adaptable to a broad variety of conditions, and capable of out-competing native or beneficial plants. An Australian tree fern, notes Tunison, can grow up to three feet a year. Native hapuu usually grow about an inch in the same time. The imported tree ferns appear to be both more sunlight-tolerant and more shade-tolerant than their native equivalents.

According to "Hawaii's Invasive Species" by George W. Staples and Robert H. Cowie, the

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INVASION

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Aussies readily colonize disturbed sites such as landslides and bulldozed areas, and also are capable of spreading into established forests. They can reach a maximum height of 36 feet, more than twice that of a hapuu. And unlike the native hapuu, which wild pigs love to eat, *Sphaeropteris cooperi* appears to be pig-resistant.

An Australian tree fern invasion of the park could be disastrous for more than the hapuu. Native tree ferns, notes Tunison, usually coexist with a rich variety of understory plants, and host a large number of epiphytes — plants that grow on trees (or tree ferns). But when Aussie ferns get established, there's not much there besides Aussie ferns.

In conjunction with the Big Island Invasive Species Committee, the park has hired invasive species expert Rob Culbertson to patrol the Volcano area for the ferns and other invasive species. Culbertson also mans a publicity booth at the community's weekly Farmer's Market to get the word out. He says he has approached a few nursery owners about the problem, as well.

"They're kind of sheepish about selling these things when they become invasive," reports

Culbertson, but he notes the nurseries have continued to sell the imported ferns.

Some of the same traits that make the Aussie ferns a bane in the native rain forest, unfortunately, make them attractive for landscaping: they're tall and showy, hardy, fast-growing, and tolerate dry and sunny conditions better than do native tree ferns. But conservationists and biologists fear that they may follow in the footsteps of other ornamental plants with the same characteristics. Parts of the park and the rain forest communities around it are already choked with kahili ginger, tibouchina, banana poka vines and faya trees, among other escaped landscaping plants.

Like all ferns, *Sphaeropteris cooperi* reproduces via spores: dust-like, near-microscopic packets of genetic material that are easily spread on the wind. The remote ancestors of native tree ferns probably arrived here as spores borne by trade winds. Some of the Aussie ferns in the park could have sprouted from spores carried quite some distance. But most spores probably don't travel that far.

"I think we're probably reducing the volume of spores landing in the park by controlling the [Australian tree ferns]

in Volcano," believes Tunison. "They're the nearest ones, and we've got a sympathetic, understanding community that values the biological diversity in the park."

To date, the anti-Australian tree fern program has uncovered about a dozen of the plants in the Volcano area. But so far, no one has taken the park up on the hapuu-for-Aussie swap offer. Most people, when informed about the problems with the Aussie ferns, have been willing to "just get rid of them," according to Tunison. One good thing about the invaders, he notes, is that they are easy to kill. The "trunk" of a tree fern is actually a tightly interwoven bundle of roots. If the growing crown of an Aussie tree fern is lopped off and disposed of, the trunk dies.

The alien trees are easily distinguished from hapuu. In addition to the Aussies' greater height, the aliens have more slender-appearing trunks, with a pattern of clean oval scars where the fronds have fallen away; hapuu fronds tend to break off irregularly as they die, leaving a stubble of frond stumps.

But the Aussies may be confused with another non-native tree fern, *Dixonia antarctica*,

which is also sometimes called an "Australian tree fern," though it originally came from Tasmania. *Dixonia* is not considered invasive. According to Culbertson, the bases of immature fronds, or "fiddleheads," on Australian tree ferns have distinctive white hairs and scales, while hapuu have rust-colored hairs and no scales, the bases of Tasmanian fiddleheads are dark and nearly hairless.

So far, Tunison says, all of the Australian tree ferns found in the park have been immature. "The biggest one we've found in the park so far has been about 4 feet.

"We've gotten young ones. They've gotten established pretty recently," he notes, but adds, "We're not taking any chances. The most efficient way to deal with alien species is to sort of nip it in the bud, you can pardon the pun."

The hapuu-for-Aussie-tree fern swap offer, he says, extends to all Volcano area residents from the golf course down to Fern Forest. Those who have Australian tree ferns in that area, and who would like to get rid of them, can contact Tunison at 985-6085 or the Big Island Invasive Species hotline at 961-3299.

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Photo by J.S. Delaney, USDA NPGS PLANTS Database



Worship Services



Interdenominational Worship Services

8:00 a.m. at the

Kilauea Military

Camp Chapel

Richard Uejo, Minister



Roman Catholic Sunday Mass

11:15 a.m. at the

Kilauea Military

Camp Chapel

Fr. Edgardo C. Bonghanoy
Rector/Office 968-6233

*Note: Persons traveling to
and from church services at
KMC are not obliged to pay
National Park entry fees.*



New Hope Christian Fellowship

8:30 a.m. at the

Hilo side of the

Akatsuka Orchid Farm

Ray Glory, Pastor

967-7129



Assembly of God Volcano

10:30 a.m.

off Wright Rd.,

on Kilinoe St.

Rev. Orville Mathison

967-8191

6



Senator Inouye Helps Nat'l. Park Service Celebrate 87 Years



*On Monday, August 25th,
U.S. Senator Dan Inouye
took to the stage and
joined Hawaii Volcanoes'
band members in a
harmonic rendition of
"Kaimana Hila." The
Senator made a special
request of the park band to
sing the classic song that
relates a Hawaiian-lyric*

...tale about Diamond Head. Said the Senator, "I'm in the mood." From left to right, Ellen Cullen, Paul Kelihoomalu, Larry Katahira, Jennifer Waipa, Annette Coats, Kaipo Kawewehi, Senator Inouye, Aku Hauanio.

Front page and this photo by Keith Ribbentrop

Could an Aussie Invasion Take Over the Park?

With the sorry experience of the faya tree as a prelude and more recently the onslaught of the notorious Coqui frog presently on our doorstep, park officials are taking seriously the threat from another likely invader emerging on the scene - the Australian Tree Fern (*Sphaeropteris cooperi*).

This time they hope to get on top of the problem well in advance of their establishment in the park. The first step taken has been to sharpen the outlook for its presence within the park itself, and sure enough, dozens have been found in relatively accessible areas in the act of spreading their spores to the further reaches where manpower would be hard pressed to control them.

Now the Park Service working in collaboration with the Big Island Invasive Species Committee (BIISC) has hired on a part time employee to survey the environs outside the park

to find out where they could be coming from. Rob Culbertson is the fellow you may meet cruising in one of the white government trucks with Coqui posters on the door panels advertising his mission. In addition to searching for the frog in the evenings, Rob hopes to contact many Volcano area neighbors during his survey during the day for the Australian Tree Fern.

While at present neither the Park nor the Department of Agriculture have any official sanction against the alien tree fern, it is hoped that an educational outreach at this point can gain the voluntary cooperation of citizens to resist buying and planting the fast growing fern in favor of the slower growing but truly emblematic native Hapu'u.

As a further inducement to neighbors wishing to help the park, Tim Tunison, Chief of Resource Management is putting forth a proposal to swap one native Hapu'u of comparable size for every Aussie alien removed. To take advantage of this offer contact Rob care of the BIISC Hotline: 961-3299, or Tim at Hawaii Volcanoes National Park: 985-6085 anytime soon. As they say in marketing, this may be a "limited time offer".

submitted by Rob Culbertson: 961-3299



**HAWAII'S
PACKAGED HOME
LEADER!**

Call our Packaged Home Specialist

*Ask about our
free home
planning rebates!*

**Eydie Clay
Hilo/Puna
934-4287**

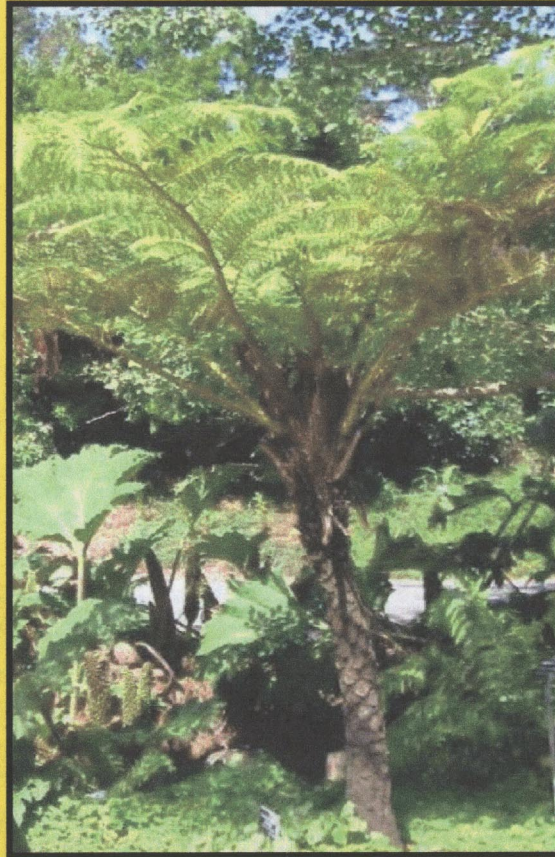
**We Will Not Be
Undersold!**

Dinner 5 pm to 9 pm

967-7969



PEST ALERT!



AUSTRALIAN TREE FERN

Threat to the Big Island

Common Name: Australian Tree Fern

Botanical Name: Sphaeropteris cooperi

Impact: An emerging major threat to overtake and displace the slower growing native tree fern (Hapu'u) especially near Hawaii Volcanoes National Park.

Known Big Island Infestations:

Volcano Village and Volcano Golf and Country Club

What to do: If you see it please report it to the hotline number below OR call the Resource Management office (985-6085) of

Hawaii Volcanoes National Park to take advantage of their free exchange program (see their flyer "An Aussie Invader - How to tell the difference from our native tree fern")

This is a voluntary program. Currently there is no listing of the Australian tree fern as a noxious weed by the state Agriculture Department

BIISC Hotline

961-3299



An 'Aussie' Invader

(*Sphaeropteris cooperi*)

How can you tell the difference from our native tree fern (*Hapu'u/Cibotium glaucum*) ?



Emerging frond or 'fiddlehead' shows distinct white hairs and scales (Hapu'u has rust colored hairs and no scales)

Overall trunk diameter is slimmer in proportion to height (Hapu'u generally stockier)

Mature Australian tree fern shows telltale oval scar pattern (Hapu'u trunk shows stubble of old fronds and irregular texture)

You can help **SAVE** our **NATIVE HAPU'U** tree ferns by **NOT** planting or cultivating Australian tree ferns **OR** by swapping your 'Aussie' for a native of comparable size - **Call 985-6085 for details** (Offer sponsored by Hawaii Volcanoes National Park - may be subject to certain limitations)

Australian Tree Fern Update to the Professional Landscape Community on Hawaii Island (Winter 2003/2004)

The old botanical name ***Cyathea cooperi*** was recently changed to ***Sphaeropteris cooperi***. This introduced tree fern has emerged as a major threat on the Big Island of Hawaii. On the other three major Hawaiian islands it has already escaped cultivation and begun to naturalize in wild lands. On the Big Island it stands ready to out compete the native stands of our emblematic *Cibotium spp.* tree ferns.



What attributes make it likely to displace native tree ferns here in Hawaii?

- **Faster growth rate** – Studies have shown *S. cooperi* to be more efficient at capturing and utilizing variable light resources. Compared to *Cibotium* species average growth rates of *S. cooperi* can be at least 5 times faster.

- **Highly adaptable** – *S. cooperi* has proven itself highly adaptable to a wider range of climate regimes including areas with significantly lower rainfall averages than its home range in Queensland, Australia. It is also known to take quicker advantage of newly disturbed lands such as road cuts.
- **Prolific spore production** – Evidence in the islands shows that millions of spores from Australian tree ferns can be carried to great lengths. On Maui infestations at Haleakala National Park were down wind 12 km from nearest likely sources. Thus control or inhibition becomes more difficult as does detection of new populations in wild lands.
- **Habitat modifying** – *S. cooperi* shares a common trait with the most dangerous invasive species in that its presence can so dominant surrounding flora as to make conditions more favorable to its own needs and less favorable for other established species. It can therefore degrade and transform a diverse plant community into a monotypic regime of its own.

What is the Economic Impact of this alien species?

Although no precise figures are presently at hand, we know that since the early nineties significant public and private resources in Hawaii have been spent on trying to control or eradicate discovered populations of Australian tree ferns. On Kauai non-profit conservation programs have made inroads into the populations in Kokee State Park. And on Maui, the staff of Haleakala National Park has been battling the tree fern invaders by the hundreds.

What is the status of this alien invasion on the Big

Island? Dozens of Australian tree ferns have been discovered in some surprisingly remote areas of Hawaii Volcanoes National Park in the last several years. Park officials have taken the lead on control efforts in the park, surveying likely sources outside the park and beginning a public education and outreach program.

What has been the public response to these efforts?

Individuals and businesses in the surveyed areas have overwhelmingly been sympathetic and supportive of the innovative exchange program that park representatives have created as an inducement to eradicating Australian tree ferns close to the park. As the educational campaign is extended it is hoped that unwitting demand for the alien tree fern will slacken and eventually cease from the consumer side.

What alternatives are there to using Australian tree ferns for landscaping on the Big Island? Our own native tree fern (Hapu`u) is available through a variety of reputable sources. Other imported tree fern species such as *Dicksonia squarrosa* and *Dicksonia antarctica* have not shown the same threatening characteristics of the Australian tree fern and could be considered equally appealing.

What can you do to help?

- Help research and implement other alternative plant materials in landscape designs.
- Spread the word within the professional community about the invasive nature of this species and the alternate recommendations that can take its place.
- Educate the public about the risks of invasive species generally.